

## Commercial-scale renewable energy in South Africa and its progress to date

Article (Published Version)

Baker, Lucy (2017) Commercial-scale renewable energy in South Africa and its progress to date. *IDS Bulletin*, 48 (5-6). pp. 101-118. ISSN 0308-5872

This version is available from Sussex Research Online: <http://sro.sussex.ac.uk/id/eprint/73037/>

This document is made available in accordance with publisher policies and may differ from the published version or from the version of record. If you wish to cite this item you are advised to consult the publisher's version. Please see the URL above for details on accessing the published version.

### **Copyright and reuse:**

Sussex Research Online is a digital repository of the research output of the University.

Copyright and all moral rights to the version of the paper presented here belong to the individual author(s) and/or other copyright owners. To the extent reasonable and practicable, the material made available in SRO has been checked for eligibility before being made available.

Copies of full text items generally can be reproduced, displayed or performed and given to third parties in any format or medium for personal research or study, educational, or not-for-profit purposes without prior permission or charge, provided that the authors, title and full bibliographic details are credited, a hyperlink and/or URL is given for the original metadata page and the content is not changed in any way.

# IDS Bulletin

Transforming Development Knowledge

Volume 48 | Number 5–6 | November 2017

## GREEN POWER FOR AFRICA: OVERCOMING THE MAIN CONSTRAINTS

Editors Ana Pueyo and  
Simon Bawakyillenuo



<b>Notes on Contributors</b>	iii
<b>Introduction: Overcoming the Constraints to Green Electricity in Africa</b> Ana Pueyo and Simon Bawakyillenuo	1
<b>Planning for Electrification: On- and Off-Grid Considerations in Sub-Saharan Africa</b> Barry Rawns and Henry Louie	9
<b>Assessing the Potential Impact of Grid-Scale Variable Renewable Energy on the Reliability of Electricity Supply in Kenya</b> Gruffudd Edwards, Chris J. Dent and Neal Wade	29
<b>Exploring the Macroeconomic Impacts of Low-Carbon Energy Transitions: A Simulation Analysis for Kenya and Ghana</b> Dirk Willenbockel, Helen Hoka Osiolo and Simon Bawakyillenuo	49
<b>Design and Assessment of Renewable Electricity Auctions in Sub-Saharan Africa</b> Hugo Lucas, Pablo del Río and Mohamed Youba Sokona	79
<b><u>Commercial-Scale Renewable Energy in South Africa and its Progress to Date</u></b> <u>Lucy Baker</u>	101
<b>The Political Economy of Investment in Renewable Electricity in Kenya</b> Helen Hoka Osiolo, Ana Pueyo and James Gachanja	119
<b>The Political Economy of Renewable Energy Investment in Ghana</b> Simon Bawakyillenuo	141
<b>The Political Economy of Aid for Power Sector Reform</b> Neil McCulloch, Esméralda Sindou and John Ward	165
<b>Glossary</b>	185

# Commercial-Scale Renewable Energy in South Africa and its Progress to Date\*

Lucy Baker

**Abstract** While South Africa's electricity sector is heavily coal-dependent, the country has recently become an attractive destination for commercial-scale renewable energy investment. This article examines ongoing developments and challenges to the country's Renewable Energy Independent Power Producers' Procurement Programme (RE IPPPP), from inception as a feed-in tariff in 2007, to its launch as a competitive bidding programme in 2011. The article discusses how the programme emerged out of a set of national conditions combined with international trends in renewable energy investment and technology development. The programme's successes include progressive requirements for socioeconomic development. However, since 2016, South Africa's renewable energy industry has faced complex challenges, including resistance by the electricity utility Eskom, itself embroiled within scandals of state capture and corruption, as well as the ability of Eskom's transmission grid to integrate renewable energy generation. Subsequent delays to the programme have generated uncertainty for stakeholders and the future of the industry.

**Keywords:** renewable energy, electricity, South Africa, wind, solar PV, renewable energy procurement, Eskom.

## 1 Introduction

South Africa's electricity sector is heavily coal-dependent, accounting for 45 per cent of the country's carbon emissions.<sup>1</sup> However, in recent years the country has become an attractive destination for commercial-scale renewable energy investment since the launch of two key national developments in 2011: a procurement programme for utility-scale renewable energy, and a national electricity master plan which set a target for renewable energy to deliver 9 per cent of supply by 2030. Though South Africa's electricity sector is still dominated by the state-owned, largely coal-fired monopoly utility Eskom, renewable electricity generated by independent power producers (IPPs) now constitutes a small but significant contribution to the overall electricity mix.

© 2017 The Author. *IDS Bulletin* © Institute of Development Studies | DOI: 10.19088/1968-2017165



This is an Open Access article distributed under the terms of the Creative Commons Attribution 4.0 International licence, which permits unrestricted use, distribution, and reproduction in any medium, provided the original authors and source are credited. <http://creativecommons.org/licenses/by/4.0/legalcode>

The *IDS Bulletin* is published by Institute of Development Studies, Library Road, Brighton BN1 9RE, UK

This article is part of *IDS Bulletin* Vol. 48 No. 5–6 November 2017: 'Green Power for Africa: Overcoming the Main Constraints'; the Introduction is also recommended reading.

South Africa's Renewable Energy Independent Power Producers' Procurement Programme (RE IPPPP) and the Integrated Resource Plan for electricity (IRP) emerged after various failed attempts to liberalise the country's electricity sector in the post-apartheid era (Baker 2017). The introduction of RE IPPPP facilitated the generation of electricity from both renewable energy sources and by IPPs for the first time, and has since attracted just over R200 billion<sup>2</sup> in investment. RE IPPPP's trajectory and that of the industry it has generated have been influenced by a number of developments at the international and national levels, including a dramatic decline in the cost of renewable energy technologies, as a result of which solar photovoltaic (PV) has become competitive with new build coal; enormous electricity tariff hikes in South Africa in recent years; and a decline in the country's economic growth and related energy demand.

Yet despite RE IPPPP's initial successes, a complexity of political, economic, and technical challenges have led to delays which now threaten its future sustainability and have generated significant uncertainty for renewable energy investors and stakeholders. Revisions to the IRP are also severely delayed. As a result of such challenges, South Africa has fallen in the rankings of Ernst & Young's renewable energy attractiveness index and now sits in 19th place, down from 11th in May 2016 (EY 2017).<sup>3</sup> But as Africa's first mover in renewable energy development, South Africa's progress or lack thereof will have inevitable lessons and spillovers for other countries on the continent where renewable energy activities are currently developing, including Kenya, Ethiopia, Tanzania, and Namibia.

This article focuses on the commercial-scale, grid-connected renewable energy sector that has emerged out of RE IPPPP thus far, for which the technologies permitted are: onshore wind, solar PV, concentrated solar power (CSP), small hydro, biomass, biogas, landfill gas, small hydro, and cogeneration (from agricultural waste). Of this, 43 per cent is for wind and 42 per cent for solar PV. RE IPPPP must be differentiated from other private sector-led electricity generation activities ongoing in South Africa which go beyond the scope of this article, and include a programme for IPPs from coal, gas, and cogeneration yet to be finalised (Baker and Burton, forthcoming), and a small but growing roof-top solar PV market (Korsten 2015).

The article's structure is as follows: Section 2 situates RE IPPPP within the context of the country's electricity sector, including the state-owned monopoly Eskom. Section 3 discusses some of the key policy developments that helped to pave the way for RE IPPPP, including the 1998 White Paper on Energy Policy, the 2003 Renewable Energy White Paper, and the IRP, the country's first national planning document for electricity. As discussed, while the IRP paved the way for RE IPPPP, subsequent hold-ups in the revision of this plan have undermined gains towards a transparent and participatory planning process. Section 4 goes on to examine the emergence of RE IPPPP as a competitive bidding auction, despite original

plans for a feed-in tariff. This section includes some of the impressive gains made as a result of the programme's progressive socioeconomic developments, in addition to emerging challenges as a result of delays to the programme. Section 5 explores some of the reasons behind these challenges including Eskom's resistance to the programme and the ongoing crisis within the utility which have resulted in its investment downgrade. Section 6 concludes that renewable energy procurement in South Africa cannot be understood, or resolved, without engaging with the very complex political economy in which it is embedded.

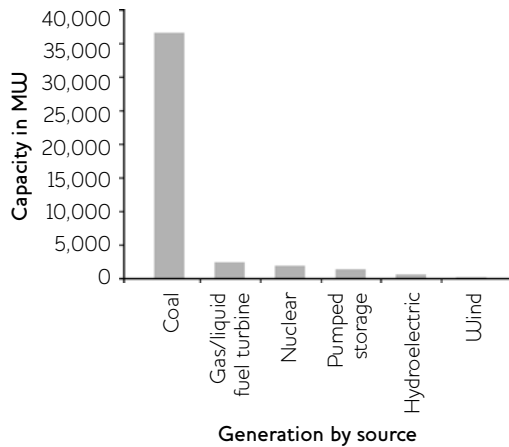
## **2 South Africa's electricity sector in context and the emergence of RE IPPPP**

It is impossible to understand the emergence and development of South Africa's renewable energy procurement programme without examining the broader context of the country's national electricity sector, including the role of the state-owned monopoly Eskom. With a nominal installed capacity of 42.8GW, of which 85 per cent is coal-fired (Eskom 2016; see Figure 1), Eskom owns the transmission grid, generates approximately 95 per cent of the country's electricity supply, and is responsible for 60 per cent of distribution, with the remainder being sold by municipalities. Eskom is also the single buyer of power. The utility has historically focused on large-scale centralised supply, building some of the world's largest coal-fired power plants.

While coal will continue to play an important role in the electricity mix for some decades, Eskom's historical dependence on South Africa's abundant sources of formerly low-cost coal is subject to change due to reasons that include national commitments to reduce its greenhouse gas emissions and significant shifts in the coal market (Burton and Winkler 2014). As discussed in Section 5, following over a decade of periodic load-shedding,<sup>4</sup> Eskom is also undergoing a financial and political crisis and is front and centre of a national scandal on state capture and corruption.

South Africa's relative isolation under apartheid meant that the country avoided the global trend of electricity sector liberalisation pushed by the World Bank and other multilateral and bilateral donors as part of structural adjustment programmes during the 1980s and 1990s (Gratwick and Eberhard 2008). While Eskom retained its monopoly as a state-owned utility, there are long-standing tensions and a spectrum of ideological differences in South Africa and its ruling party the African National Congress (ANC), between those advocating for state ownership of the electricity sector at one end and those for liberalisation and market reform at the other. Eskom has long resisted the introduction of IPPs and the creation of an Independent Systems Operator for transmission as this would undermine its current monopoly control (Baker and Burton, forthcoming). As discussed in Section 3, such tensions are illustrated in the failure to fully implement measures put forward in the 1998 White Paper on Energy Policy which ultimately led to delays to the construction of new generation capacity in the early 2000s. Current delays to RE IPPPP are arguably continued illustration of such tensions.

Figure 1 Eskom's nominal capacity in MW



Source Eskom (2016: 128).

To put Eskom's generation capacity into perspective, the commercial-scale renewable energy capacity that has emerged out of RE IPPPP accounted for approximately 2.9 per cent of the country's electricity supply in 2016 (CSIR 2017a). Under RE IPPPP, 92 projects constituting just over 6,300MW of peak generating capacity have been approved under four bidding rounds and are now at various stages of development (IPPP Office 2017; see Table 2). By the first quarter of 2017, 3,052MW of electricity generation capacity from 56 IPP projects were connected to the national grid and all of the projects approved under rounds one and two of RE IPPPP were operational (IPPP Office 2017).

Alongside RE IPPPP as a programme for utility-scale projects, a small IPP programme was launched in 2013 for projects of between 1MW and 5MW. This gives bidders the option to use equipment supplied by 'South African power generation equipment manufacturers, who may not have international certification,'<sup>5</sup> unlike the main RE IPPPP which insists on internationally certified technologies.

Since mid-2015, electricity generated by solar PV and wind has become cost-competitive with that generated by Eskom's new build coal-fired power plants, Medupi and Kusile. Such a development follows global trends which see solar PV and wind reaching grid parity with conventional sources of energy generation (UNEP/BNEF 2015). Since the start of RE IPPPP, the tariffs at which winning projects will sell their electricity to Eskom have dropped dramatically: the average solar PV tariff has decreased by 75 per cent, wind by 50 per cent, and CSP by 43 per cent (see Table 1). RE IPPPP also accounts for one of the largest investment streams into the country in recent years (Green Cape 2017). At the time of writing, just over R200 billion<sup>6</sup> for both debt and equity had been committed, of which 24 per cent is foreign investment (IPPP Office 2017: 2).

**Table 1 Actual average tariffs, rounds 1–4 of RE IPPPP**

Tariffs	Round 1 (Nov. 2011)	Round 2 (March 2012)	Round 3 (Aug. 2013)	Round 4 (Nov. 2015)	Average percentage drop, Round 1–4
Wind	R 1.52	R 1.19	R 0.87	R 0.62	50%
Solar PV	R 3.65	R 2.18	R 1.17	R 0.62	75%
CSP	R 3.55	R 3.32	R 3.11	R 2.02	

Source Adapted from CSIR (2017a: 5).

Yet despite such progress, and as discussed in further detail in Section 4, the more recent bidding rounds of RE IPPPP have been beset by delays and uncertainty. Winning projects selected under round four were announced in April 2015, with a second announcement generally referred to as round 4.5, taking place in June 2015. But financial close for these projects which should have been reached by April 2016, has been stalled due to Eskom's continued refusal to sign the power purchase agreements (PPAs). A fifth round, which was slated to be announced in 2016 has been put on hold with no clarity at the time of writing. Under the small IPP programme, ten successful projects amounting to 49MW have been announced thus far but have also yet to reach financial close.

**Table 2 Project status under each bidding round of RE IPPPP rounds**

	Round 1	Round 2	Round 3	Round 3.5 (CSP only)	Round 4/4.5	Round 5	Small IPP (project size 1–5MW)
<b>Submission date</b>	November 2011	March 2012	August 2013	March 2014	August 2014	<i>Should have taken place in mid-2016. Process now stalled</i>	October 2013
<b>Number of projects approved</b>	28 projects	19 projects	17 projects	2 projects	26 projects	N/A	10 projects
<b>Contracted capacity</b>	1,425MW	1,040MW	1,457MW	200MW	<i>2,205MW procured but not signed</i>	N/A	<i>49MW procured but not signed</i>
<b>Date of financial close</b>	November 2012	May 2013	December 2014	August 2016	<i>Not yet signed</i>	N/A	<i>Not yet signed</i>
<b>Operational</b>	Yes	Yes	9 projects by March 2017		No	N/A	No

Source Compiled from DoE (2016), CSIR (2017a: 4), IPPPP Office (2017).



### 3 Key policy developments

A number of national and international developments paved the way for the emergence of what is now RE IPPPP. These include, firstly, national commitments to climate change mitigation following President Jacob Zuma's pledge to reduce carbon emissions by 34 per cent by 2020 and 42 per cent by 2025 below a business-as-usual trajectory at the United Nations Framework Convention on Climate Change (UNFCCC) conference in 2009 (RSA 2015). Secondly, the 2008 global financial crisis contributed to a slump in the renewable energy markets of Europe and the US, which led developers and technology manufacturers to seek new opportunities elsewhere, including in South Africa. Thirdly, policy developments at the national level played a key role, including the 1998 White Paper on Energy Policy, the 2003 White Paper and the IRP, as is now discussed.

The 1998 White Paper on Energy Policy (DME 1998) set out the gradual liberalisation of Eskom's functions into separate generation, distribution, and transmission companies (Gaunt 2008). The subsequent Eskom Conversion Act of 2001 converted the utility from a statutory body to a public company which required that it pay tax and dividends for the first time. Eskom's stakeholder-based electricity council was replaced by a board of directors and the government, represented by the Minister of Public Enterprises, was appointed as the utility's sole shareholder. The White Paper was followed by a 2001 cabinet memo announcing that 30 per cent of electricity supply would be generated by IPPs and a subsequent ruling that Eskom no longer be allowed to build new electricity generation.

Despite these initial steps, key aspects of the 1998 White Paper were never implemented, including the creation of a separate transmission company. Indeed, the Independent Systems and Market Operator Bill that would do this has been continually postponed to date. Significantly, between 1998 and 2003 no new generation was built, reasons for which include resistance from Eskom and the unions, lack of capacity from the then Department of Minerals and Energy, and a lack of regulatory clarity that discouraged potential investors (Eberhard 2007; Baker *et al.* 2015). By 2007, the country was faced with a falling electricity reserve margin and an imminent electricity crisis so in a *volte-face*, a cabinet memo approved that Eskom should be re-allowed to construct more power plants but that 30 per cent of new generation should be built by IPPs. While the power sector reform envisaged by the White Paper was never completed, it still represents an early attempt to achieve what RE IPPPP ultimately managed to do.

A subsequent policy development was the Renewable Energy White Paper, published by the Department of Minerals and Energy in 2003 with support from Danish bilateral assistance. This paper set a target of 10,000GWh of renewable energy contribution to final energy consumption by 2013, to be produced mainly from biomass, wind, solar, and small-scale hydro (DME 2003). Though the paper was

never formally adopted and the renewable energy commitment it proposed was minimal, it nonetheless provided a stimulus for the initial development of a feed-in tariff, which was to have created a market mechanism in order to meet this target.

Some years later, the introduction of the country's first electricity planning document in May 2011, the IRP, set a renewable energy target of 17,800MW, which if built would deliver 9 per cent of electricity supply by 2030. The IRP is significant because it represents the first time that electricity planning has taken place in South Africa and while the plan's negotiation was delayed and heavily contested, it was still considered something of a breakthrough (Baker *et al.* 2015). Not least under apartheid there was no formal process for electricity planning and policymaking and no department dedicated to it either. Instead, this role was carried out by Eskom, which took all decisions for electricity new build. It was not until the Electricity Regulation Act, introduced in 2006, that the necessary powers for the country's Department of Energy (DoE) (created in 2009 which took over the energy policy function from the former Department of Minerals and Energy) to conduct an open planning process for electricity were established. Under the Act, responsibility was formally allocated to the energy minister to approve the construction of new generation capacity and what the source of that capacity should be. Before an electricity generation project can be granted a licence by the country's electricity regulator, it must align with the technological allocations set by the IRP. The IRP also claims to be consistent with a carbon emissions constraint of 275 million tonnes of carbon dioxide annually after 2024 (DoE 2011: 6).

However, subsequent revisions of the IRP, in keeping with the requirement that the plan be updated every two years have stalled. A second revision was released in 2013 for public comment (DoE 2013) but was never formally adopted by the government. The main reason attributed to this was because the draft advised against the construction of 9.6GW of new nuclear capacity included in the original plan. There are two main reasons for this advice: firstly, due to a decline in economic growth and reduced energy intensity in the economy, the 2013 draft projected a lower electricity demand up until 2030 and by implication a reduced requirement for the construction of new capacity. Secondly, the draft questioned the high associated costs of nuclear technology, stating that 'the revised demand projections suggest that no new nuclear baseload capacity is required until after 2025 (and for lower demand not until at earliest 2035)' (DoE 2013: 8). As further discussed in Section 5, the potential nuclear programme is being pushed by the presidency and some factions of Eskom, and is an area of high political and economic controversy.

A second IRP draft was released in late 2016 for which a country-wide consultation process was held with a closing date for comments of early February 2017.<sup>7</sup> Key concerns expressed by the renewable energy industry and civil society about this document are that it places constraints on the uptake of renewable energy and assumes that

the prices of renewable energy technologies are much higher than those reflected in the recent tariffs submitted under RE IPPPP (CSIR 2017b). By mid-2017, at the time of writing, the latest draft of the IRP had yet to be finalised. As a result of such delays, the only valid IRP document is now five years out of date and based on assumptions that no longer apply. It has been argued that despite the gains that the first IRP represented in terms of increased transparency in post-apartheid energy policymaking, the stalling of both the 2013 and 2016 versions signals a return to highly secretive decision-making, characteristic of decision-making in energy under apartheid (Baker *et al.* 2015). Such uncertainty is but one of various challenges facing the future of the country's renewable energy sector. Before exploring these challenges in greater depth, the emergence of RE IPPPP is discussed in Section 4.

#### **4 From REFIT to RE IPPPP**

The original mechanism to stimulate South Africa's utility-scale renewable energy sector was to have been in the form of a feed-in tariff, referred to as REFIT, which was originally developed in 2007 by individuals within the electricity regulatory division of the national energy regulator, supported by others from within the Treasury, the Department of Public Enterprises, and the Department of Environmental Affairs, in addition to bilateral technical assistance from Germany and Denmark (Baker 2017). One of REFIT's stated objectives was to create a market mechanism that would 'kick start and stimulate the renewable energy industry in South Africa' in order to meet the target of 10,000GWh of renewable energy by 2013, as set out in the 2003 Renewable Energy White Paper discussed in Section 3.

A feed-in tariff pays IPPs a fixed price for each unit of renewable electricity that they sell to the grid, which is set at a higher rate than the retail price of electricity generated from conventional resources. In comparison, under a competitive bidding system or auction, potential project developers bid for a renewable energy contract below a certain tariff cap. Because the latter system is more competitive, it has become the preferred global model of renewable energy procurement (EY 2014). After a number of years of protracted negotiation, REFIT was scrapped unexpectedly in August 2011 and replaced by a competitive bidding system in the form of RE IPPPP (Baker 2017).

Crucially, the launch of RE IPPPP provided the much-needed certainty to investors, not least for its 20-year government-backed, local currency-denominated PPA, which protects project developers from the risks posed by a fluctuating rand and from any potential failure of Eskom to pay for the electricity generated. Under RE IPPPP, Eskom's role is reduced to the designated buyer of power, while project selection and evaluation is carried out by the IPP-unit. The IPP-unit was set up by National Treasury's Public Private Partnership unit together with foreign technical consultants to deal specifically with RE IPPPP in light of the DoE's lack of capacity to manage a renewable energy procurement programme (more recent developments in relation to

the IPP-unit are discussed in further detail in Section 5). RE IPPPP was internationally lauded for its high-quality regulatory framework, tough qualification criteria, and strong economic development and community ownership requirements, and subsequently created an investment climate that quickly became very popular with international renewable energy developers, technology suppliers, and engineering and construction companies.

A notable feature of RE IPPPP is its progressive requirements for socioeconomic development which align closely with priorities outlined in various national plans and documents on growth and industrial policy such as the National Development Plan, the New Growth Path and the Green Economy Accord. Scoring of bids is allocated 70 per cent on the tariff at which IPPs will sell electricity to Eskom and 30 per cent on economic development criteria, which includes factors such as job creation, local content requirements, participation of historically disadvantaged individuals, rural development, community ownership, and skills development. The socioeconomic development criteria must be met before the price submission will be considered with successful bids being the ones that meet the requirements at the lowest price. Such requirements are particularly significant given South Africa's high levels of unemployment, socioeconomic, and racial inequality, and a national skills deficit.

RE IPPPP also requires that project companies, most of which are special purpose vehicles set up for the exclusive purposes of developing, operating, and owning the project, have a minimum of 40 per cent shareholding by national companies, of which a minimum of 12 per cent to be held by black economic empowerment companies<sup>8</sup> and a 2.5 per cent shareholding by the local community within a 50km radius of the project site.

Such requirements have resulted in some impressive gains. According to Green Cape (2017: 21), over 24,000 job years have been created from RE IPPPP, including in the phase of project construction, and operation and maintenance of numerous plants and equipment manufacturing. Community shareholders in projects approved under rounds one to four of RE IPPPP are set to benefit from an income of R29 billion<sup>9</sup> over the 20-year duration of the projects. A number of educational initiatives have also been set up for the creation of 'green technical skills', including at various colleges across the country. For instance, the establishment of the South African Renewable Energy Technology Centre (SARETEC) in the Western Cape offers internationally accredited courses for wind turbine and solar PV service technicians.

RE IPPPP's local content requirements which require that a certain percentage of project spend be dedicated to locally procured equipment, services, and skills have helped to facilitate the establishment of a number of manufacturing and assembly plants mainly for wind towers, solar PV panels and invertors. The bulk of investment in this area has thus far gone to the Western Cape Province including the Atlantis Special Economic

Zone (Green Cape 2017: 36). Given that the local content percentage has increased with each round, by round three all wind towers should have been manufactured in-country. Studies for the potential of the localisation of wind solar PV, and CSP industries have been carried out by various different departments and/or donors and private sector institutions (DTI 2015; Ahlfeldt 2013; SASTELA 2013). This is in addition to the approval of the Special Economic Zone (SEZ) Act in May 2014 which provides financial and other incentives for investment in renewable energy manufacturing (DTI 2013). The aim of an SEZ is to keep as much of the value chain process in one place by supporting a larger manufacturer that would then allow small, medium and micro enterprises and smaller suppliers to input into the value chain through logistics, transport, and other services (Baker and Sovacool 2017).

However, despite the positive developments generated by local content requirements, delays to the programme discussed in further detail in Section 5 have had a knock-on effect on the manufacturing industry. For instance, in June 2017 the heavy manufacturing company DCD sold its share of the R536 million DCD wind tower manufacturing plant to South Africa's Industrial Development Corporation (IDC), which already owned a 20 per cent share, for a mere R1 (Allix 2017).<sup>10</sup> The plant has also had to lay off employees. In the solar PV industry, two leading inverter manufacturers, Germany's SMA and AEG, that both set up in South Africa in 2014 with the aim of supplying to RE IPPPP projects, shut down in 2016, citing the programme's delays as the main reason why (Hopson 2016). Others, including Trina Solar refrained from setting up a manufacturing plant in the first place (Creamer 2015).

A further contributing factor has been the manipulation of local content requirements by some developers, particularly in the case of solar PV in the first three rounds (Baker and Sovacool 2017). Because local content is measured in spend, some developers have met the requirements by purchasing non-module items such as civil works, grid connections, and inverters and importing their modules from abroad (Deign 2016), an act that violates the spirit of the requirements, if not the letter of. This has been exacerbated by the absence of import duties on solar PV modules into South Africa, which tends to give the advantage to imported PV modules which are usually cheaper (Mulcahy 2012), despite the pressure that South African manufacturers have put on the DTI.

In terms of ownership of the country's emerging renewable energy industry, there is also concern that RE IPPPP has privileged large international companies over national ones, reflecting the increasing global consolidation of the renewable energy industry. Such companies, including global majors such as Mainstream Renewable Power, Enel Green Power, Abengoa, Acciona, and Scatec Solar, have had sufficient capital to withstand the various delays in the programme's implementation and have been able to submit winning bids with very low prices in a process that has become increasingly competitive (Baker 2015). Some of the causes of such delays are now discussed in Section 5.

## 5 Key challenges for renewable energy in South Africa

Beyond the uncertainties in electricity planning discussed in Section 3, the stability and future development of the country's renewable energy industry is threatened by a number of challenges. These include severe delays to the programme due to the refusal by Eskom to sign 37 outstanding PPAs; the downgrading of Eskom's investment credit rating together with that of the national economy in June 2017; management scandals and allegations of corruption linked to Eskom, itself part of broader national political turmoil; and emerging evidence of state capture in relation to the nuclear programme being pushed by Eskom and the Presidency (Bhorat *et al.* 2017).

One key obstacle to the rollout of utility-scale renewable energy in South Africa is the cost of upgrading the transmission grid and substations to absorb growing levels of renewable generation. As RE IPPPP has progressed, grid constraints have become increasingly prevalent and there is now very limited capacity for project connection in areas with good wind and solar resources (Baker *et al.* 2015: 38). This is particularly the case in the Northern Cape Province where the majority of solar PV and CSP projects are located. Under RE IPPPP, Eskom is required to cover the costs of strengthening the transmission network and upgrading substations to connect projects, while IPPs pay to connect their projects to the grid. However, as Eskom is not involved in project selection, it has been unable to determine grid reinforcement needs until the winning projects have been announced and so has not been able to provide geographical incentives to IPPs. Consequently, it is likely that grid availability will be taken into account in future rounds when assessing bid submissions (Green Cape 2017: 27).

A further potential challenge to RE IPPPP is the announcement made in May 2017 by the DoE that the IPP-unit is to be incorporated into the country's Central Energy Fund, a state-owned company that currently owns PetroSA and the Strategic Fuel Fund (Creamer 2017b). This move is significant and unexplained given that the IPP-unit has been highly respected as a high-quality, transparent, and secure professional body since being established in 2011, because as Eberhard, Kolker and Leigland suggest, it 'did not start out with the level of mistrust of private business that sometimes characterises other government agencies in South Africa' (2014: 9). As discussed in Section 4, while the unit functions on behalf of the DoE, it sits outside of formal departmental governmental structures. The incorporation of the unit into the Central Energy Fund has been met with caution by industry, not least given the fund's history of poor governance (Paton 2017).

Most significantly, Eskom has refused to sign PPAs for 37 projects approved under RE IPPPP. While round five was to have been announced in 2016, by mid-2017 this was yet to happen and no capacity has been procured since 2015. Eskom's resistance to RE IPPPP began to be felt in late 2015 when it announced that it would not provide budget quotes, which indicate the potential cost for a renewable energy project

to connect to the grid. The utility then announced in July 2016 that it would not sign any new PPAs with IPPs beyond those selected under the expedited round four of RE IPPPP, and refused to sign a PPA for a CSP project approved under round three. Eskom's refusal to sign PPAs is an act that goes beyond its mandate, given that it is the DoE's role to make policy on energy under the 2006 Electricity Regulation Act. The move, which represents a clear attempt by the utility to challenge the procurement of further independent power generation, was eventually condemned by the Treasury and the DoE in September 2016 (Creamer 2016). However, nearly a year later the impasse endures, despite a pledge by Jacob Zuma in February 2017 in his 'state of the nation' address that the PPAs would be signed in April 2017. The utility has not provided a formal reason as to why it has refused to sign the PPAs, though it has claimed firstly that it will make a loss on having to purchase energy from IPPs (SAREC 2017), and secondly that the country's energy supply has stabilised since the most recent round of load-shedding in 2014/15 and therefore additional capacity from renewable energy is unnecessary. In its 2016 annual report, Eskom stated that the purchase of electricity from IPPs accounts for 18 per cent of primary energy but contributes only 4 per cent of the electricity generated (Eskom 2016: 91).

Such resistance by Eskom takes place within the context of a long-term financial and supply-side crisis within the utility for reasons that are entrenched and complex (Baker *et al.* 2015). The latest symptoms of this crisis have resulted in periodic load-shedding since 2006 and led to unsustainably high levels of debt, despite large state bail-outs and a loan from the World Bank as a 'lender of last resort' in 2010 for the controversial Medupi coal-fired power plant. Eskom's average electricity prices increased by approximately 200 per cent between 2008 and 2016,<sup>11</sup> and current tariff decisions are now the subject of legal review (Baker and Burton, forthcoming). There have also been substantial cost overruns in the utility's new build programme, including in the 4.8GW Medupi and Kusile coal-fired power plants. For the time being, electricity supply has now stabilised, due to reasons that include the operationalisation of the first unit of the Medupi coal-fired plant; the introduction of renewable energy from IPPs; and perhaps most significantly, a decline in economic growth and energy demand from the country's energy-intensive industrial users in recent years.

However, Eskom is still very much in crisis and has been subject to repeated scandal over its management, and allegations of corruption and state capture. Firstly, a corruption investigation is taking place into the contracts between Eskom's power stations and their coal suppliers, in particular the irregular sale of the Optimum coal mine (which supplies to the Arnot coal-fired power station) by mining giant Glencore to a company owned by the Indian Gupta family, which has been found to have increasing influence over President Jacob Zuma and his allies. Eskom has stated its refusal and/or inability to make information public regarding its coal supply contracts and volumes burned by each power station (Creamer 2017a). A high-profile investigation into state capture

by the country's Public Protector, published in November 2016, heavily implicated the then chief executive of Eskom, Brian Molefe. Molefe swiftly resigned but in several highly controversial twists was then reappointed in early May 2017 and subsequently fired again by the end of the month. In April 2017, Business Leadership South Africa called for Eskom to replace its board. In June, the Chairman of Eskom resigned. Such developments contributed to the downgrading of the country's foreign currency debt to junk status in April 2017 by both S&P Global Ratings and Fitch Ratings (Bisseker 2017) while Eskom was subsequently downgraded to junk status by all three ratings agencies in June 2017.

Despite this, Eskom, backed by the presidency, seems set to pursue its plans for a 9,600MW, state-driven nuclear fleet against all odds: President Zuma's unexpected cabinet shuffle in March 2017 removed finance minister Pravin Gordhan because of his alleged opposition to the nuclear programme and installed a new energy minister believed to be in favour of it. The revised nuclear determination of December 2016 transferred nuclear procurement responsibilities from the DoE to Eskom and the South African Nuclear Energy Corporation. In a case brought by the non-governmental organisations (NGOs) Earth Life South Africa and SAFCEI in late April 2017, the Western Cape High Court judged that the intergovernmental agreements on nuclear cooperation signed in 2014 between South Africa and five countries were unconstitutional and unlawful, particularly in the case of the agreement signed between Eskom and Russia's state-owned nuclear company Rosatom (Ensor 2017). The court further judged that the two determinations released to allow for the nuclear procurement process were irrational, illegal, and unconstitutional (Creamer 2017b). Despite this ruling, the government has since announced that the nuclear procurement programme will start afresh. Given the centralised nature of the technology, it would seem that nuclear power would serve to bolster the interests of a monopoly-controlled electricity system whilst marginalising that of renewable energy.

## 6 Conclusion

This article has provided an insight into some of the challenges to what was until recently deemed to be a highly successful renewable energy programme. Such challenges include resistance to RE IPPPP by the country's monopoly utility Eskom which has refused to sign outstanding PPAs; delays to the revision of the IRP which would provide certainty on the allocation of future electricity generation capacity; the downgrading of both Eskom's and the country's investment rating; related allegations of state capture and corruption; attempts by the presidency to push through a large nuclear fleet; and uncertainty over the ability of Eskom's transmission grid to integrate increasing levels of renewable energy generation.

As discussed, ownership and control over South Africa's electricity generation, transmission, and distribution remains complex, contested, and political. Decision-making and changes within the country's electricity sector are embedded within complex social, political, and economic forces and relationships. Faced with a financial and



supply-side crisis and now at junk investment rating, Eskom is now challenged by a small but significant programme for renewable energy independent power production. Yet due to the utility's resistance, the future of this programme is stalled, and the IRP that has played such a key role in opening possibilities for the development of renewable energy generation is also on hold. Meanwhile, the uncertainty generated by Eskom's crisis and the broader political scandals to which it is linked have discouraged potential investors. The rapid development of renewable energy markets elsewhere, for instance in Mexico, Argentina, Chile, and Morocco, are overtaking South Africa's original successes.

In parallel, a contested and secretive process for the procurement of nuclear power looks subject to continue, despite legal rulings to the contrary. Such a programme, if it goes ahead, would be procured and paid for by the state and in turn electricity consumers, but be constructed and supplied by a foreign company. What then do such developments represent for the future of RE IPPPP, in addition to other structures of the country's electricity governance upon which the renewable energy programme depends?

While a number of Eskom's challenges are undoubtedly technical, particularly with regard to connecting growing levels of renewable energy projects to the grid, recent developments highlight the extent to which the utility has been able to subvert the procurement of renewable energy. Large-scale and successful deployment of renewable energy threatens Eskom's existing monopoly and the preferred technologies that serve to uphold it: coal and nuclear power. The introduction of nuclear power would strengthen Eskom's monopoly stronghold and the paradigm of large-scale, centralised, and state-owned supply.

The scenario examined here seems to present a dichotomy that pits a deeply entrenched, coal-fired, state-controlled monopoly utility at one end that seeks to develop nuclear in order to perpetuate its stronghold, against an emerging privately generated renewable energy industry on the other that is pushing for a shift in infrastructure towards an increasingly flexible electricity grid. While such a dichotomy may be simplistic, such dynamics illustrate long-standing national tensions as discussed in Section 2 over who should govern, generate, and control electricity. These tensions are compounded by significant and increasingly rapid innovations in the technologies that generate electricity. Indeed, the increase in generation from intermittent and variable resources such as wind and solar PV requires much greater flexibility of grid management than South Africa's current model can provide. This raises a key question with regard to the ownership and management of the country's electricity grid, with the continued failure to create an independent transmissions operator as a critical factor in this discussion.

Meanwhile, Eskom and related coalitions within the ruling party are now subject to increasing scrutiny as the networks of state capture, in which institutions of electricity governance are deeply embroiled,

start to unravel. Will this scrutiny provide the opportunity that the renewable energy industry needs to overcome the political, economic, and technical obstacles currently blocking its continued development and allow it to resume its previous successes in a way that prioritises the national interest?

### Notes

- \* The work for this article was supported by the Engineering and Physical Sciences Research Council (EPSRC) grant number: EP/K011790/1 (Research Centre on Innovation and Energy Demand).
- 1 At 215.6Mt CO<sub>2</sub> emissions in 2015 (Eskom 2016).
- 2 Approximately US\$15.4 billion based on July 2017 exchange rates. Note that there are differing reports of this investment, probably due to fluctuating exchange rates between the rand and the dollar. For instance, Eberhard and Kåberger (2016) state that US\$19 billion was invested between 2010 and 2016.
- 3 Countries that have overtaken it include the middle-income economies of Morocco, now in 14th place and Argentina in 12th.
- 4 Load-shedding refers to planned interruption of the electricity supply in order to manage supply-side constraints.
- 5 [www.ipp-smallprojects.co.za/](http://www.ipp-smallprojects.co.za/).
- 6 Approximately US\$15.4 billion based on July 2017 exchange rates.
- 7 [www.sapvia.co.za/integrated-resource-plan-irp-consultation-workshop-dates/](http://www.sapvia.co.za/integrated-resource-plan-irp-consultation-workshop-dates/).
- 8 Black economic empowerment refers to legislation introduced in the post-apartheid era to attempt to address socioeconomic marginalisation along racial lines.
- 9 Approximately US\$2.2 billion at July 2017 exchange rates.
- 10 The wind tower manufacturing plant, which opened in 2014, was a joint initiative between the DCD Group, the IDC, and the Coega Development Corporation, which manages the Coega industrial development zone in which the plant is located.
- 11 Calculated from Eskom's figures: [www.eskom.co.za/CustomerCare/TariffsAndCharges/Pages/Tariff\\_History.aspx](http://www.eskom.co.za/CustomerCare/TariffsAndCharges/Pages/Tariff_History.aspx).

### References

- Ahlfeldt, C. (2013) *The Localisation Potential of Photovoltaics and a Strategy to Support Large Scale Roll-Out in South Africa*, report prepared for the South African Photovoltaic Industry Association (SAPVIA), the World Wildlife Fund (WWF) and the Department for Trade and Industry (DTI), [http://awsassets.wwf.org.za/downloads/the\\_localisation\\_potential\\_of\\_pv\\_and\\_a\\_strategy\\_to\\_support\\_large\\_scale\\_roll\\_out\\_in\\_sa.pdf](http://awsassets.wwf.org.za/downloads/the_localisation_potential_of_pv_and_a_strategy_to_support_large_scale_roll_out_in_sa.pdf) (accessed 1 August 2017)
- Allix, M. (2017) 'Renewables Sector Being Ravaged by State's Failure to Co-ordinate', *Business Day*, 5 June
- Baker, L. (2017) 'Post-Apartheid Electricity Policy and the Emergence of South Africa's Renewable Energy Sector', in D. Arent *et al.* (eds), *The Political Economy of Clean Energy Transitions*, WIDER Studies in Development Economics, Oxford: Oxford University Press

- Baker, L. (2015) 'The Evolving Role of Finance in South Africa's Renewable Energy Sector', *Geoforum* 64: 146–56
- Baker, L. and Burton, J. (forthcoming) 'The Politics of Procurement and the Low Carbon Transition in South Africa', in A. Goldthau, M. Keating and C. Kuzemko (eds), *Handbook on the IPE of Energy & Resources*, Cheltenham: Edward Elgar
- Baker, L. and Sovacool, B. (2017) 'The Political Economy of Technological Capabilities and Global Production Networks in South Africa's Wind and Solar Photovoltaic (PV) Industries', *Political Geography* 60: 1–12
- Baker, L.; Burton, J.; Godinho, C. and Trollip, T. (2015) *The Political Economy of Decarbonisation: Exploring the Dynamics of South Africa's Electricity Sector*, Rondebosch, Cape Town: Energy Research Centre, University of Cape Town
- Bhorat, H. et al. (2017) *Betrayal of the Promise: How South Africa is being Stolen*, <http://47zhcvti0ul2ftip9rxo9fj9.wpengine.netdna-cdn.com/wp-content/uploads/2017/06/Betrayl-of-a-promise.pdf> (accessed 1 August 2017)
- Bisseker, C. (2017) 'SA's Credit Rating: The Good News', *Financial Mail*, 8 June
- Burton, J. and Winkler, H. (2014) *South Africa's Planned Coal Infrastructure Expansion: Drivers, Dynamics and Impacts on Greenhouse Gas Emissions*, Rondebosch, Cape Town: Energy Research Centre, University of Cape Town
- Creamer, T. (2017a) 'Busa Urges Nersa to Reject Eskom's Request to Deviate from Tariff Methodology', *Engineering News*, 30 May
- Creamer, T. (2017b) 'IPP Office to be Incorporated into Overhauled Central Energy Fund', *Engineering News*, 19 May, [www.engineeringnews.co.za/article/ipp-office-to-be-incorporated-into-overhauled-central-energy-fund-2017-05-19](http://www.engineeringnews.co.za/article/ipp-office-to-be-incorporated-into-overhauled-central-energy-fund-2017-05-19) (accessed 31 July 2017)
- Creamer, T. (2016) 'Capital Follows Certainty', *Engineering News*, 8 September, [www.engineeringnews.co.za/article/capital-follows-certainty-cennerg-warns-amid-ipp-flux-2016-09-08](http://www.engineeringnews.co.za/article/capital-follows-certainty-cennerg-warns-amid-ipp-flux-2016-09-08) (accessed 31 July 2017)
- Creamer, T. (2015) 'Chinese Solar PV Supplier Hopes to Secure Big Slice of SA's Rooftop Market', *Engineering News*, 9 April, [www.engineeringnews.co.za/article/chinese-solar-pv-supplier-hopes-to-secure-big-slice-of-sas-rooftop-market-2015-04-09](http://www.engineeringnews.co.za/article/chinese-solar-pv-supplier-hopes-to-secure-big-slice-of-sas-rooftop-market-2015-04-09) (accessed 31 July 2017)
- CSIR (2017a) 'Statistics of Utility-Scale Solar PV, Wind and CSP in South Africa in 2016', presentation, Council for Scientific and Industrial Research (CSIR) Energy Centre, April 2017
- CSIR (2017b) *Formal Comments on the Integrated Resource Plan (IRP) Update Assumptions, Base Case and Observations 2016*, Council for Scientific and Industrial Research, [www.csir.co.za/sites/default/files/Documents/IRP\\_Update\\_Assumptions\\_1904.pdf](http://www.csir.co.za/sites/default/files/Documents/IRP_Update_Assumptions_1904.pdf) (accessed 31 July 2017)
- Deign, J. (2016) 'South Africa's Module Industry Grows on Local Content Push', *NewEnergyUpdate: PV*, 2 February, <http://analysis.newenergyupdate.com/pv-insider/south-africas-module-industry-grows-local-content-push> (accessed 31 July 2017)

- DME (2003) *White Paper on Renewable Energy*, Pretoria: Department of Minerals and Energy
- DME (1998) *White Paper on the Energy Policy of the Republic of South Africa*, Pretoria: Department of Minerals and Energy
- DoE (2016) 'Briefing on the South African Independent Power Producers Procurement Programme', Department of Energy, 23 August 2016
- DoE (2013) *Integrated Resource Plan for Electricity (IRP) 2010–2030 Update*, Pretoria: Department of Energy, [www.doe-irp.co.za/content/IRP2010\\_updatea.pdf](http://www.doe-irp.co.za/content/IRP2010_updatea.pdf) (accessed 28 August 2017)
- DoE (2011) *Integrated Resource Plan for Electricity (IRP) 2010–2030*, Government Gazette No. 34263, 6 May, Pretoria: Department of Energy, [www.doe-irp.co.za/content/IRP2010\\_promulgated.pdf](http://www.doe-irp.co.za/content/IRP2010_promulgated.pdf) (accessed 31 July 2017)
- DTI (2015) *The Wind Energy Industry Localisation Road Map in Support of Large-Scale Roll-Out in South Africa*, Integrated Final Report prepared by Urban-Econ Development Economists for the Department for Trade and Industry, Pretoria: Urban-Econ Development Economists
- DTI (2013) 'Localisation and Investment Promotion for Renewable Energy', 7 March, Department for Trade and Industry, [www.dedea.gov.za/Presentations/Provincial%20Renewable%20Energy%20Forum%20Presentations/Provincial%20Sustainable%20Energy%20Forum%20Meeting%20-%200313/20130307%20Ntombifuthi%20Ntuli%20Energy%20Forum%20East%20London.pdf](http://www.dedea.gov.za/Presentations/Provincial%20Renewable%20Energy%20Forum%20Presentations/Provincial%20Sustainable%20Energy%20Forum%20Meeting%20-%200313/20130307%20Ntombifuthi%20Ntuli%20Energy%20Forum%20East%20London.pdf) (accessed 6 October 2015)
- Eberhard, A. (2007) 'The Political Economy of Power Sector Reform in South Africa', in D. Victor and T.C. Heller (eds), *The Political Economy of Power Sector Reform*, Cambridge: Cambridge University Press
- Eberhard, A. and Kåberger, T. (2016) 'Renewable Energy Auctions in South Africa Outshine Feed-In Tariffs', *Energy Science & Engineering* 4.3: 190–93
- Eberhard, A.; Kolker, J. and Leigland, J. (2014) *South Africa's Renewable Energy Procurement Programme: Success Factors and Lessons*, Washington DC: Public–Private Infrastructure Advisory Facility (PPIAF), [www.gsb.uct.ac.za/files/PPIAFReport.pdf](http://www.gsb.uct.ac.za/files/PPIAFReport.pdf) (accessed 31 July 2017)
- Ensor, L. (2017) 'Lynne Brown Sticks to Her Guns on Eskom's IPP Deals', *Business Day*, 25 May
- Eskom (2016) *Eskom Integrated Report*, 31 March 2016, [www.eskom.co.za/IR2016/Documents/Eskom\\_integrated\\_report\\_2016.pdf](http://www.eskom.co.za/IR2016/Documents/Eskom_integrated_report_2016.pdf) (accessed 28 August 2017)
- EY (2017) 'Renewable Energy Country Attractiveness Index (RECAI)', May, Ernst & Young, [www.ey.com/gl/en/industries/power---utilities/ey-renewable-energy-country-attractiveness-index-latest-issue](http://www.ey.com/gl/en/industries/power---utilities/ey-renewable-energy-country-attractiveness-index-latest-issue) (accessed 1 August 2017)
- EY (2014) 'Renewable Energy Country Attractiveness Index (RECAI)', February, Ernst & Young, [www.ey.com/gl/en/industries/power--utilities/renewable-energy-country-attractiveness-index](http://www.ey.com/gl/en/industries/power--utilities/renewable-energy-country-attractiveness-index) (accessed 31 July 2017)

- Gaunt, C.T. (2008) 'Electricity Distribution Industry Restructuring in South Africa: A Case Study', *Energy Policy* 36.9: 3448–59
- Gratwick, K.N. and Eberhard, A. (2008) 'Demise of the Standard Model for Power Sector Reform and the Emergence of Hybrid Power Markets', *Energy Policy* 36.10: 3948–60
- Green Cape (2017) *Utility-Scale Renewable Energy: 2017 Market Intelligence Report*, Cape Town: Green Cape
- Hopson, C. (2016) 'South African PV Sector Slams Delays as Manufacturers Close Shop', *Recharge News*, 25 October
- IPPP Office (2017) *Independent Power Producers Procurement Programme, An Overview: As at 31 March 2017*, [www.ipp-projects.co.za/Publications](http://www.ipp-projects.co.za/Publications) (accessed 5 August 2017)
- Korsten, N. (2015) 'An Investigation into the Financial Impact of Residential Embedded Generation on Local Governments in South Africa: A Case Study into Stellenbosch Municipality', MPhil thesis, Faculty of Economic and Management Sciences, Stellenbosch University
- Mulcahy, M. (2012) 'Review of the Competitive Bid for PV in South Africa: Is South Africa Maximising Job Creation and Value for Money from its Photovoltaic Industry?', research paper presented to the Graduate School of Business, University of Cape Town in partial fulfilment of the requirements for the master's degree in development finance
- Paton, C. (2017) 'Independent Power Producer Office to be Shifted', *Business Day*, 22 May
- RSA (Republic of South Africa) (2015) 'South Africa's Intended Nationally Determined Contribution', [www4.unfccc.int/submissions/INDC/Published%20Documents/South%20Africa/1/South%20Africa.pdf](http://www4.unfccc.int/submissions/INDC/Published%20Documents/South%20Africa/1/South%20Africa.pdf) (accessed 31 July 2017)
- SAREC (2017) *Are Eskom's Concerns Relating to IPPs Valid?* Gauteng: South African Renewable Energy Council
- SASTELA (2013) *Assessment of the Localisation, Industrialisation and Job Creation of Potential of CSP Infrastructure Projects in South Africa – A 2030 Vision for CSP*, <http://protermosolar.com/helioscsp/wp-content/uploads/2015/05/GIZ-CSPStudy-FinalReportJune2013.pdf> (accessed 5 August 2017)
- UNEP/BNEF (Frankfurt School–UNEP Centre/BNEF) (2015) *Global Trends in Renewable Energy Investment 2015*, Frankfurt School of Finance & Management gGmbH, [www.fs-unep-centre.org](http://www.fs-unep-centre.org) (accessed 27 September 2015)